

**FEDERAL COUNCIL FOR SCIENCE AND TECHNOLOGY  
EXECUTIVE OFFICE BUILDING  
Washington, D. C.**

**Minutes of Meeting  
FCST Committee Chairmen and Executive Secretaries  
February 10, 1965**

The meeting was convened at 2:00 p.m., in Room 208 Executive Office Building.

**Attendance:**

Dr. Donald F. Hornig, Chairman, Federal Council for Science and Technology  
Dr. Colin M. MacLeod (OST)  
Mr. Robert Abel, Interagency Committee on Oceanography (ONR)  
Colonel A. A. Aines, Committee on Scientific and Technical Information (DOD)  
Dr. Allen Astin, Committee on Scientific Personnel and Standing Committee (NBS)  
Mr. George Auman, Committee on Scientific Personnel (NBS)  
Captain Sherman Betts, USN, Interdepartmental Committee on Atmospheric Sciences (Commerce)  
Mr. James Denny, Patent Advisory Panel (Commerce)  
Dr. William Eaton, Patent Advisory Panel (Commerce)  
Mr. Howard H. Eckles, Natural Resources Committee (Interior)  
Lt. General William Ely, USA, Committee on Scientific and Technical Information (DOD)  
Dr. Howard W. Etzel, Coordinating Committee on Materials Research and Development (NSF)  
Dr. J. Herbert Hollomon, Interdepartmental Committee on Atmospheric Sciences (Commerce)  
Mr. William L. Hooper, Standing Committee (OST)  
Mr. Ray Linsley, Committee on Water Resources Research (OST)  
Dr. J. Howard McMillen, Technical Committee on High Energy Physics (NSF)  
Dr. Robert Morse, Interagency Committee on Oceanography (DOD)  
Mr. George Pavelis, Committee on Water Resources Research (Agriculture)  
Mr. Herman Pollack, International Committee (State)  
Dr. Henry Riecken, Committee on Behavioral Sciences (NSF)  
Dr. Randal Robertson, Technical Committee on High Energy Physics (NSF)  
Mrs. Bertha Rubinstein, Committee on Behavioral Sciences (NSF)  
Mr. William Salmon, International Committee (State)  
CDR. Edward Snyder, USN (Office of the Asst. Secretary of the Navy for R&D)

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1. Report on Congressional Attitudes Towards R&D, and the 1966 Budget --  
Dr. Hornig

Both the Daddario and Elliott Committee reports have been useful in helping to change the general mood of Congress from one of alarm over the size and rate of growth of R&D expenditures that prevailed a couple of years ago to a mood of acceptance of continuing heavy expenditures at a modest rate of growth, with a more critical examination of individual programs.

The 1966 budget for the first time splits R and D, which is a useful approach. The "R" segment continues to increase at a moderate rate totally -- from \$5.0 to \$5.5 billion -- and the "R" budgets of most agencies increase moderately. The "D" segment remains constant at about \$10 billion. The distinction between R&D and between operating research funds and capital investment was reflected throughout Special Analysis H of the 1966 budget. In oceanography, for example, the research and survey segment of the budget increased by about 16 percent, while the capital program decreased by 27 percent. The total program increased slightly.

For the first time, the situation with respect to support of academic research was reviewed across the board, and a rationale for the rate of increase of total Federal support of academic research was developed. This was done with and accepted by BOB, and the review represents a substantial step forward in planning R&D expenditures.

2. Functions of FCST and its Committees

Dr. Hornig outlined the structure and functions of OST as background for the functions of FCST and its committees. He pointed out that OST has statutory authority and responsibility, not only to advise but to assist the President on such matters as major policies, plans and programs of the agencies, and review, integration and coordination of major Federal activities in science and technology.

In carrying out these responsibilities, OST has two major advisory arms. One is PSAC, which provides free ranging advice on any aspect of science and technology by people who do not hold government posts. The other is FCST, which provides advice by responsible governmental officials, and which serves in fact as the mechanism for many coordinating activities relating to the programs of the Federal agencies which are not ad hoc but continuing. FCST committees are the primary device for getting this job done.

FCST also has an innovative, creative role that has not been adequately developed, and it similarly has a responsibility to anticipate problems as

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contrasted with dealing with them after they occur. Various FCST committees will probably participate in these FCST activities as they develop more fully.

Since FCST is advisory, its actions are not binding on agencies and this is explicitly noted in the Executive Order establishing FCST. The agencies may choose to follow advice or positions taken by FCST, and generally do so, because most FCST positions are arrived at by consensus.

The entire complex for dealing with science and technology in the Executive Office of the President -- OST, BOB, the Special Assistant for Science and Technology, PSAC and FCST -- continues to evolve as the problems change. At this time, the FCST committees fall into two general groups. The first consists of those which deal with substantive scientific and technological areas, or programs (for example, oceanography, atmospheric sciences, materials, high energy physics, behavioral sciences, natural resources and water resources). The second consists of those which deal with the administration of science (for example, scientific and engineering personnel, long range planning, scientific information, patent policy and international affairs).

The work of the "administrative" committees tends to cut through the work of all of the "substantive" committees. For example, COSATI is legitimately concerned with the activities of all committees in the area of information and communications. On the other hand, each "substantive" committee is responsible for these activities in its own areas. Problems have arisen in the communication among the committees -- between ICAS and COSATI, for example. The answer lies in full exchange of agenda and minutes, closer OST staff ties and adequate reporting by committee members to their principals.

### 3. Specific Questions Relating to Committee Operations

#### (a) Chairmanship of Committees

Some committees have agency staff and others have OST staff as chairmen. The circumstances under which the chairman will be from OST or an agency depends on a number of factors -- the nature of the committee's tasks, the degree of dispersion of relevant activities among the agencies, and the availability of people.

#### (b) Permanent and Ad Hoc Committees

The committee structure will be under continuing review to ensure that each committee is performing a task which justifies its existence. In all probability, more ad hoc groups will be set up to deal with urgent problems, and fewer continuing committees will be established.

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Each committee should periodically review the effectiveness of its own work, and make recommendations to the FCST on the status and on obstacles to more effective work.

(c) Nature of Committee Advice

Committees should not undertake to develop a consensus which represents a least common denominator and which ignores real differences of opinion between agencies. When differences exist, the committee should present organized statements of divergent views, define the issues and present alternative courses of action to the FCST.

(d) Relations between Committees and OST

FCST committees are in part performing staff work for OST. Accordingly, closer relations between OST staff and the committees will be encouraged. The practical limit of this relationship is set at this time by the size of the OST staff.

FCST committees should not await requests from FCST or from OST before undertaking to deal with problems. On the other hand, requests for committee work will often come from FCST or OST.

(e) Staffing of Committees

Budget Bureau Circular A-63 has apparently been interpreted for some committees by Budget Bureau staff as meaning that FCST committees may be staffed only by people from the chairman's agency. Dr. Kidd agreed to discuss this with the Bureau of the Budget. (A memorandum stating that committee staff need not come solely from the chairman's agency has been distributed.)

(f) FCST Committees, the Budget Process and Congress

It is inherently difficult for those FCST committees which deal with budgetary matters to influence agency budgets, and virtually impossible when the committee work does not affect the early stages of budget process -- specifically, the spring review. The committees will be given guides by OST on the timing and content of their budgetary work. The manner in which committee chairmen will participate in discussions of committee activities with the Bureau of the Budget and Congressional committees will be taken up with each committee chairman, because the situation of each committee differs.

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One key to effective planning by committees is close attention to the substance of the research and development for which the committee is responsible (as contrasted with emphasis on distribution of missions and tasks, and the mechanics of budgets), and also at least a two-year look ahead at the programs of concern to the committee.

To the extent that committees establish relationships with Congress, OST should be kept fully informed: committees as such should communicate formally with Congress only through OST. Committee chairmen should coordinate plans for testimony closely with the Director of OST.

(g) Committee Missions and Agency Missions

Efforts by FCST committees that undertake to develop programs that are more than the sum of agency programs are inherently complicated. Particular difficulties are encountered if these efforts involve proposals to increase agency budgets for activities related to the program being fostered by the committee. Such an activity should be undertaken only through the Director of OST.

The heart of the problem is that the program segments are contained in parts of the budgets of many agencies. Within each agency, the priorities set by the responsible operating officials of the agency may not include a high priority for the program fostered by the committee. This creates a difficult situation for which there is no general solution. The most effective approach to a reasonable solution necessitates (a) early formulation of program proposals and budgets by the committees; that is, in time for consideration during the spring budget review, and (b) continuing contact with OST staff as proposals are developed.

The meeting adjourned at 4:30 p.m.

Charles V. Kidd  
Executive Secretary

Approved by the Chairman

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RECOMMENDATIONS FOR  
NATIONAL DOCUMENT HANDLING SYSTEMS  
IN SCIENCE AND TECHNOLOGY

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NATIONAL DOCUMENT HANDLING SYSTEMS  
IN SCIENCE AND TECHNOLOGY

Committee on Scientific and Technical Information  
(COSATI)

Federal Council for Science and Technology

November 1965



FEDERAL COUNCIL FOR SCIENCE AND TECHNOLOGY  
COMMITTEE ON SCIENTIFIC AND TECHNICAL INFORMATION

Washington, D. C. 20506

15 November 1965

Dr. Donald F. Hornig, Chairman  
Federal Council for Science and Technology

As you requested, an ad hoc task group\* from the Committee on Scientific and Technical Information has endeavored to develop the conceptual framework for an improved national network of information systems in science and technology. This is the beginning of a comprehensive attempt to develop guidelines for planning, so that the information activities within each department and agency might be developed in a coordinated, nonduplicative manner. It is also expected that suggestions might be made to nongovernment organizations concerned with information in science and technology.

The reason for the study is the close relation between research and development and the information systems in science and technology. Although a good information system does not guarantee good research and development, the lack of a good information system may be harmful to effective and efficient research and development programs.

The job is not done. I take pride, however, in forwarding to you this report on the first phase of the study--dealing with the document-handling systems in the United States.

Respectfully submitted,



William T. Knox, Chairman  
Committee on Scientific and  
Technical Information

\*Task Group on National System(s) for Scientific and Technical  
Information:

William T. Knox, Chairman  
Burton W. Adkinson  
Walter M. Carlson  
Melvin S. Day  
Ellis A. Johnson

Foster E. Mohrhardt  
Donald A. Schon  
John Sherrod  
Andrew A. Aines, Secretary

## FOREWORD

Because of the widespread interest in the long-range planning activities of the Committee on Scientific and Technical Information, I am making this report publicly available. I hope by this means to encourage active participation by nongovernmental groups in developing a more effective and efficient national network of information systems in science and technology.

I emphasize the advisory nature of the report. Its recommendations are currently being reviewed by Federal organizations and groups concerned with science and technology.

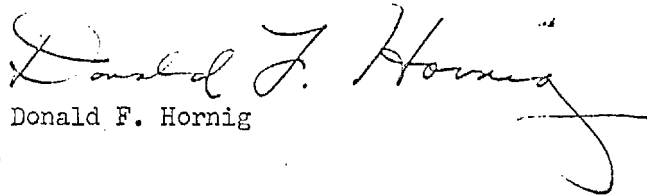
  
Donald F. Hornig

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APPENDIX A - Recommendations for National Document Handling Systems in Science and Technology - A Background Study - System Development Corporation, Sept. 1965.	
APPENDIX B - Charter for Task Group on National System(s) for Scientific and Technical Informa- tion, Committee on Scientific and Technical Information, Federal Council for Science and Technology, Nov. 30, 1964.	

### Background

Since 1957 and the dramatic launching of Sputnik I, much has been done in the Federal Government and in the private sector to learn more about the information systems undergirding science and technology, their problems and potentialities, and to develop mechanisms and programs to bring about more effective and efficient information systems. Two panels of the President's Science Advisory Committee issued widely-read reports, and two special task groups have added their thoughts and recommendations directly to the President's Science Adviser. Congressional committees, notably the Senate Subcommittee on Government Reorganization under the chairmanship of the then-Senator Hubert Humphrey, and the House Committee on Science and Astronautics under the chairmanship of Representative George Miller, through their thorough investigations of the role of information systems in research planning and coordination in Federal agencies, have stimulated agencies to take a number of progressive steps. Since the fall of 1957, a heightened awareness to the importance of effective and efficient information networks has evolved within the scientific and technical community and in the Federal agency management.

At the same time, the information problem has not grown less. Indeed, since 1957, the Federal Government has spent \$100 billion to support science and technology, and the results of this massive outpouring of dollars has been an equally massive flood of recorded information. Not all of this information is of equal value, but to decide on the valuable parts requires an increasingly large effort. Fuller exploitation and use of information is being emphasized to promote the growth of the national economy and the general health and welfare.

A number of recommendations have been made previously to ameliorate the information problem. Because of their relation to the recommendations presented in this report, a brief review follows of the major conclusions and recommendations of three prominent advisory reports--the Baker, Crawford, and Weinberg reports--as they relate to document handling.

#### Baker Panel (1958) <sup>1/</sup>

Arising out of its conclusions that "progress in science is dependent upon the free flow of scientific information," and that "publication of research information is absolutely essential," the Baker panel recommended the

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<sup>1/</sup> W. O. Baker, et al, Improving the Availability of Scientific and Technical Information in the United States. Panel Report of the President's Science Advisory Committee, 7 Dec. 1958.

establishment of a Federal science information service, to assist and coordinate existing programs of government agencies and private organizations for short-term relief, and to encourage and support a long-term research and development program. The Baker report pointed out that within the National Science Foundation there was an organization (subsequently called the Office of Science Information Service) which could be bolstered to carry out these functions. The Office of Science Information Service has gradually enlarged its functions, and in FY 1966 its budgeted program amounted to \$12.5 million. Major emphasis has been given to the support of primary and secondary publications and to translations of the foreign technical literature. In addition, OSIS has supported through the traditional NSF grant mechanism, a large number of research and development projects in science information and information systems.

Crawford Task Force (1962)<sup>2/</sup>

In 1962 Dr. Jerome B. Wiesner, Science Adviser to the President, appointed a special task force to examine Federal information programs. The task force made two major organizational recommendations designed to improve the flow of recorded information within the Federal Government, as follows:

- (1) A central authority should be established to:
  - (a) define objectives of government information programs
  - (b) plan, develop, and guide organization of government information activities
  - (c) develop criteria (including financial) for effective operation of government-wide information system
  - (d) review and evaluate performance of Federal agency information systems
  - (e) provide systems research, engineering and development
- (2) Each research and development agency of the Federal Government should set up an office exercising agency-wide direction and control of information activities.

The central authority, which the Crawford Task Force recommended to be the Office of Science and Technology, has not been established. However, the Office of Science and Technology assigned a full-time staff member to information systems beginning in 1963. Numerous inter-

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<sup>2/</sup> J. H. Crawford, G. Abdian, W. Fazar, S. Passman, R. B. Stegmaier, Jr., and J. Stern, Scientific and Technical Communications in the Government. Task Force Report to the President's Special Assistant for Science and Technology, ID-290-5145, Apr. 1962.

agency information problems have also been identified by the Committee on Scientific and Technical Information since its establishment in 1963, and several interagency standards have been developed. Since the Committee on Scientific and Technical Information is, however, an interagency advisory committee, development of criteria for agency information programs and evaluation of these programs are beyond its capability.

The recommendation that each research and development agency establish an office exercising agency-wide direction and control of information activities has largely been implemented. The three agencies most heavily involved in science and technology--the Department of Defense, the Atomic Energy Commission, and the National Aeronautics and Space Administration--have large information programs. While the Department of Defense has no statutory obligation to disseminate its internally-generated information to the public, it has tried to keep its far-flung contractor community (numbering some 20,000 in the United States) supplied with an effective information network. Both AEC and NASA have a statutory obligation to disseminate information generated through their operations to the public. As a result, AEC and NASA have well-organized science information functions as part of their line organizations.

Weinberg Panel (1963)<sup>3/</sup>

The Weinberg Panel of the President's Science Advisory Committee recommended that "Each Federal agency concerned with science and technology must accept its responsibility for information activities in relevant fields, and must devote an appreciable fraction of its talent and other resources to support of information activities." This recommendation has failed to find general acceptance. Some Federal agencies, such as AEC and NASA, had already accepted their responsibilities as integral parts of their missions, and were devoting significant talent and other resources to support of information activities. Nevertheless, there are broad areas of science and technology outside the fields of nuclear energy and space exploration. There are also areas of science and technology in which nongovernment groups have performed effectively for many years, overlapping in some cases the purview of Federal agencies. The reluctance of some Federal agencies to accept responsibility for areas of science and technology is understandable; there has been no determination by the Congress that the Federal Government has the responsibility for ensuring the existence of a healthy information system covering all of science and technology.

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<sup>3/</sup> A. M. Weinberg, et al, Science, Government, and Information: The Responsibilities of the Technical Community and the Government in the Transfer of Information. Report of the President's Science Advisory Committee, 19 June 1963.

### Statement of the Problem

In late fall, 1964, the time was ripe for another attempt to fashion a more effective and efficient national network of information systems in science and technology. A special task group from the Committee on Scientific and Technical Information was established at the request of Dr. Donald F. Hornig, the President's Science Adviser, and Chairman of the Federal Council for Science and Technology. As is made clear by the task group charter (Appendix B), a very ambitious task was undertaken. The task was no less than the design of a national information transfer system or network of systems which would serve the needs of practicing scientists and engineers and their managers in such a way as to promote the more effective and efficient execution of the national research and development program.

From the beginning, the task group looked upon its assignment as a systems engineering problem. Initial attention was focused on that part of the system dealing with document handling. Left for later analysis were the less-well defined areas of initial distribution of research and development results, secondary services, critical information analysis and evaluation functions, and the important oral communications network that exists throughout science and technology.

The task group was assisted in its study of the national document-handling system by the System Development Corporation. A comprehensive analysis of the national document-handling network, and recommendations for its improvement are included in the System Development Corporation report (Appendix A). The report contains a wealth of valuable information, and its evidence, its conclusions, and its recommendations were considered at length by the task group. The task group recommendations differ considerably from those presented by the System Development Corporation, although there is general agreement with the System Development Corporation statement of basic propositions or assumptions, and systems requirements. These differences are described in more detail in the "Recommendations" section of this report.

### Basic Assumptions

Notably lacking in most of the proposed national "plans" for an information system in science and technology has been a clear statement of the basic assumptions underlying the plans. This lack has vastly complicated the ensuing discussion and debate. The basic assumptions or propositions on which the Committee on Scientific and Technical Information task group has built its statement of the national system(s) requirements and its recommendations for action are outlined in the following paragraphs.\*

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\*The statement of assumptions is nearly identical with the corresponding statement in the System Development Corporation report (Appendix A); these assumptions were, in fact, largely formulated by the System Development Corporation, but they have been modified and reworded by the Committee on Scientific and Technical Information.

1. The Federal Government has the responsibility to ensure that there exists within the United States at least one accessible copy of each significant publication of the worldwide scientific and technical literature.

In some areas of science and technology, such as medicine, agriculture, aeronautics, and nuclear energy, Federal Government agencies have already been charged by the Congress to assume this responsibility, because of the relation to national goals and agency missions. In other areas the responsibility may be tacitly accepted, subject to the administrative judgment of agency management. This assumption states clearly the Federal Government responsibility for ensuring access to significant literature in all areas of science and technology.

Federal agencies would be expected to accept this responsibility because the successful completion of their research and development missions requires the existence of effective and efficient information systems in science and technology. Although some agencies, as mentioned above, have provided such information systems, other agencies have relied on the initiative of nongovernmental groups to provide the necessary information systems. Only a few nongovernmental groups have been able to cope with the new demands and the vastly-increased volume of information, and even these have been aided by government support.

Acceptance of this responsibility is in harmony with Federal Government acceptance of the responsibility for ensuring adequate trained manpower in science and engineering, and for ensuring an adequate level of basic research in the United States. Basic research and education in the sciences and engineering are intertwined, as the President's Science Advisory Committee (Seaborg) report 4/ stressed, and they both feed on and in turn nourish the published literature.

In the words of President Kennedy, "One of the major opportunities for enhancing the effectiveness of our national scientific and technical effort and the efficiency of Government management of research and development lies in the improvement of our ability to communicate information about current research efforts and the results of past

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4/ "Scientific Progress, The Universities, and The Federal Government," Statement by the President's Science Advisory Committee, Wash., D. C., 15 Nov. 1960; Panel on Basic Research and Graduate Education; Glenn T. Seaborg, Chairman.



efforts. Strong science and technology is a national necessity and adequate communication is a prerequisite for strong science and technology." 3/

The phrase "significant publication" needs elaboration. There is no intent of trying to relate completely the significance of new published knowledge to current goals and objectives, although such relation should be, and is, an essential part of every scientist's and engineer's perusal of the current literature. Rather, it is recognized that bona fide knowledge about the laws of nature may find application in a number of unexpected uses, some long after the original publication. Significant, then, refers mainly to knowledge acquired and reported in a scholarly, professional manner.

There is an obverse side to this definition of "significant;" it implies that there are insignificant publications. Few, if any, scientists and engineers will debate this. In the words of a nuclear physicist recently, "This book served me by focusing my attention on the torrent of bad books that is presently flooding the scientific market. It made me ask myself why we fill our library shelves with frequently worthless books." 2/

The acceptance by the Federal Government of responsibility for ensuring an accessible copy of all significant literature in science and technology carries with it an acceptance of the necessity for providing criteria for recognizing and eliminating from Federal library collections the insignificant literature. Nonfederal libraries may also benefit.

This assumption also implies that there must be a comprehensive national listing and index of documents held by the major libraries. Indexing of some of the serial literature in science and technology (excluding medicine and agriculture) has traditionally been done by some scientific and engineering professional societies, and will probably continue. Acceptance of the responsibility by the Federal Government for maintaining a national listing and index of documents carries with it a greater degree of coordination and support of the documentation activities of the scientific and engineering professional societies than heretofore.

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5/ "A Book Which Shall Remain Un-Named," Lawrence Dresner, Reviewer. Excerpt, p. 274, v. 22, #2, June 1965, Nuclear Science and Engineering.

An "accessible copy" implies that a copy or reproduction of the original will be available in reasonable time, without unusual efforts by the requester.

"Scientific and technical" literature is broadly conceived. Not only should the physical and life sciences be included, but also the behavioral and social sciences. Technology is likewise broadly defined.

2. The Federal Government has the responsibility to see that there is appropriate acquiring, announcing, processing, and making accessible the significant worldwide scientific and technical literature to qualified individuals and organizations in the United States.

This assumption elaborates on the first assumption, and spells out the functions required in the document-handling system. While there may be objections voiced on first reading "qualified" individuals, experience shows that some screening of requesters will be necessary to promote the principle of local access to the literature. In the absence of screening, as the experience of the National Library of Medicine clearly shows, a centralized Federal document facility can be overloaded with requests which can be equally well-handled from local facilities.

This assumption does not carry with it the implication of universal free accessibility to the literature, but service fees should be kept at a level which optimizes the use of the system in relation to its operating costs. There will be a basic operating cost for the system regardless of the number of users. However, the cost of servicing requests for literature copies is almost directly related to the number of requests. Effective and efficient management of the system will require as skilled marketing techniques as it will require skilled production methods.

3. Any system(s) must take account of primary publication (e.g., books, serials, pamphlets, reports) and secondary publications (e.g., indexes and abstracts) and the processing of these.
4. Information centers are a permanent part of any national system(s) for handling scientific and technical information.
5. A critical part of the scientific and technical information system is in the nondocument area, such as oral communications, conferences, and symposia.

Although this report makes no recommendations for action in this area, this assumption is included because informal

means of communication are very important to the working scientist and technician. The products of meetings, symposia, etc., enter the document system as proceedings or reports and would be handled like any other document. The Committee on Scientific and Technical Information task group intends to study this area in detail.

6. There will be important portions of the national information system(s) (e.g., publishers, abstracting and indexing activities, research libraries) independent of the Federal Government. The impact of the Federal portion, in terms of subsidy, cooperative services, and leadership, will have an important influence on the nonfederal portion, and this relationship must be continuously explored and defined with the Government taking such actions as are necessary to maintain a viable system.

In the words of the President's Science Advisory Committee (Weinberg) report 2/, "Government involvement in scientific communication is going to grow, just as Government involvement in science and technology is growing. We must always seek to insure on behalf of both the Federal Government and the technical community, that the Federal information system remains adequate but does not overwhelm the existing non-Government systems, and that our Government and non-Government systems continue to develop into an effectively interwoven instrument that is always responsive to the changing needs of our science and technology."

7. The document-handling system(s) will service a wide variety of users, including, among others:

Scientists, technical personnel, scholars and students working in university settings;  
Scientists and technical personnel working privately in industry and in the Government;  
Administrators and managers.

Document-handling systems must not only satisfy the needs of the different categories of users, but are required to recognize the problems involved in information transfer between types of users within the same profession. Within a community of research scientists communication of research results takes place easily and rapidly. However, there may be severe difficulties in transmitting research results from the scientist to the engineer, especially on intricate and interdisciplinary problems.

8. The introduction of advanced technology into the national document-handling system is required. Ultimately, the growth in number of

documents and their representations will be so great the problems of cost, storage space, preservation of documents, and indexing will become so large that the present manual systems will become inadequate.

9. The cost-effectiveness ratio for introducing new technologies into the document-handling system needs to be determined in terms of the services rendered. Different technologies may also be evaluated in terms of system cost for an equivalent amount (in quantity and quality of information transfer.

This assumption recognizes that new technologies in document handling--as in many other service activities--tend to cost more than the system or procedures they replace. The offsetting benefits must be gained from improvement in the performance of the scientists, engineers, and other technical personnel who are served by the document systems.

10. Any systems proposed must be evolutionary in character in the sense that they will start with the present systems such as libraries and information exchanges and evolve to forms which will be consistent with an overall plan. There must be flexibility for new organizational and administrative arrangements.
11. The systems developed for the scientific and technical literature need not necessarily be compatible with systems used for other parts of the world literature, such as law, the arts, and humanities. For instance, the indexing, cataloging, processing, and storage systems for scientific and technical literature may be different from that for other literature.
12. Classification and indexing schemes adopted for our national systems will be as compatible with international procedures and standards as is feasible.

#### General Management Requirements

1. Overall policies and plans concerning the Federal Government's role in scientific and technical information activities, including document handling, need to be developed, and the implementation of these policies and plans needs to be coordinated and monitored.
2. Policies and recommendations are required concerning the legislative bases for document and information services in or sponsored by the Federal agencies, which will identify and clarify agency roles in national information systems.

As a previous Committee on Scientific and Technical Information study has shown, legislative authority and responsibility given to Federal agencies for information systems and services varies widely. The development of more effective and efficient national information systems is seriously hampered by the lack of consistent legislation.

3. More definitive guidelines are required for cost and budgetary analysis and control of agency information services.

For the past several years, the Committee on Scientific and Technical Information and the National Science Foundation have endeavored to develop costs and budgetary data for agency information services. While progress has been substantial, there are large gaps in the data. A major part of the costs of agency information services and support has to be estimated, due mainly to the integral relation of information transfer (communication) to research and development itself. The Committee on Scientific and Technical Information task group recognizes the interwoven nature of scientific communication and research and development. Nonetheless, it also recognizes the potential benefits in planning, coordination, and evaluation which will result from the availability of better cost data. The establishment of good cost data is also a valuable aid for the planning and evaluation of proposed new systems aimed at increasing the productivity of its users.

4. A central review is required of each agency's budgetary program for document and information services as it relates to the national system(s).
5. Central coordination is required of the development of long-range plans for the national document-handling and information systems, including plans for the establishment of facilities serving various elements of the system, such as central referral (or switching) facilities and research project registries.

These requirements are elaborations of the first requirement, and spell out two of the mechanisms for coordination and review of the total Federal program.

#### Systems Requirements

The following list of systems requirements is not intended to be comprehensive, but instead highlights those general requirements which form the basis of the task group conclusions and recommendations. For

a more comprehensive list, the reader may refer to the System Development Corporation report (Appendix A, pp. 4-7 to 4-17). The task group has reviewed the System Development Corporation list of systems requirements, and takes no exception to them.

1. A number of large-scale experimental information and document-handling programs will be required in order to determine detailed design data for an integrated national network of systems.

Implicit in this requirement is a requirement that the system evolve from the present situation. The 1965 Office of Science and Technology (Licklider) Panel on Scientific and Technical Communications stated in its report, 6/ "It is not the time, yet, to design a national system for scientific and technical communication. It is the time to start developing an overall conceptual framework for a national system; a plan to guide research and development. Moreover, it is time to build experimental or exploratory systems capable of handling actual problems and perhaps of growing or evolving into operational systems." The Committee on Scientific and Technical Information task group agrees with this statement. The MEDLARS project at the National Library of Medicine, the network of state-based information centers to be established under the State Technical Services Act of 1965, the Atomic Energy Commission and National Aeronautics and Space Administration computer-based abstracting and indexing services, the new computer-based chemical information system of the Chemical Abstracts Service, and the numerous information evaluation and analysis centers are all examples of large-scale information transfer experiments which will lead to improved systems design and integration.

2. A continuing effort will be required to harmonize the demands of the information producer and user for maximum flexibility in language usage with the system needs for standardization.

Many organizations, both inside and outside the Government, are promoting greater standardization of language. Such activities have made possible the present document-handling systems, and the inadequacies of the present systems are most glaring in those sectors of science and technology which have not made the requisite effort to standardize language usage. Increasing usage and increased mechanization of document-handling systems will require

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6/ 8 Feb. 1965 Report to Dr. Donald F. Hornig, Director, Office of Science and Technology, by Office of Science and Technology Ad Hoc Panel on Scientific and Technical Communications; J.C.R. Licklider, Chairman.

increased standardization; the costs associated with massive revision of information already placed in machine-processable form are great. The newer document and information-handling systems will also be expected to provide more error-free retrieval.

3. The system will require intensive participation and involvement by those producing and using scientific and technical information, extending to the actual operation of information and document-handling facilities by scientific and engineering organizations.
4. There is a requirement that users and students be knowledgeable about the functions, interrelations, and general methods employed by the system. Educational and training programs will be required.
5. Capability to conduct research on information systems will be required, and staff units possessing this capability should be a part of every major unit in the national network of systems.
6. The system will require the acquisition of at least one reproducible copy of every significant foreign and domestic document and making them accessible while minimizing unnecessary acquisition and translation.
7. The system scope will embrace all fields of scientific and technical literature.

The Committee on Scientific and Technical Information task group believes that the responsibility for ensuring coverage of the scientific and technical literature should be assigned among Federal agencies in a coordinated fashion. The assignment of agency responsibility should be clear. It is not the intent of this statement to mean that Federal agencies would operate the completed system, but only that they will have responsibility for ensuring complete coverage by some government or nongovernment organization.

8. The system will require policies and programs for the long-term preservation of its document holdings. This requirement influences policy with regard to the loan, reproduction, and distribution of documents to qualified requesters.
9. The system will also require that responsible agents develop policies and programs aimed at purging the system of unneeded information.

To assist the retirement of information from the active system store, a more comprehensive program is needed to develop reviews, monographs, textbooks, movies, and

other teaching aids, involving incorporation of the new knowledge into the accepted body of knowledge.

10. Each system within the national network should have its own index, switching center and referral apparatus. In addition, there is an urgent need to determine the most appropriate form of switching center for the national network as a whole.
11. Decentralized local access to documents and information is required to meet the needs of a geographically dispersed user population.
12. Compatible methods for processing and servicing requests for documents need to be developed.
13. The system must have the capacity to handle a 5-6% annual increase in significant documents by 1970 and a doubling every ten to fifteen years.\* An increase in translation capacity will also have to be provided.
14. Policies are required concerning Federal support for professional societies related to their effective functioning as a part of any national scientific and technical document-handling system, particularly their activities in abstracting, indexing, reviewing, and dissemination.
15. There is a requirement to ensure that sufficient numbers of adequately educated and trained personnel for operating the national system are available. This includes categories such as librarians, information technologists and scientists, and clerical personnel.

#### Conclusions

Based on the considerations and evidence presented in this report and its appendixes, and building on the basic assumptions or propositions and on the systems requirements presented in the preceding sections, it is concluded that:

1. Effective information transfer and document-handling systems in science and technology are necessary, but by themselves are not sufficient for the optimal conduct of Federal research and development programs. Federal agency managements should be concerned

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\*Supporting data for this quantitative system requirement are given in the System Development Corporation report (Appendix A).



about the effectiveness and efficiency of these systems, as they affect the pursuit of national goals and agency missions. Just as "the strength of the research and development programs of the major agencies, and hence their ability to meet national needs, depends heavily on our university system, "<sup>7/</sup> so it may be said the research and development programs depend heavily on the document-handling systems in science and technology.

2. Existing information and documentary services, including libraries, have been established and have proliferated without benefit of guidelines from a national interest point of view, as to scope of coverage, quality of service, cost of service, and relation to other services. As a result, there are wide variations in the quality and quantity of information and documentary services available in different sectors of science and technology.
3. There is need for an integrated national network of document-handling systems in science and technology. It is difficult to prove conclusively that inadequacies in the present complex of documentary services have caused poorer science and technology, because there are nondocumentary avenues for obtaining information. Nevertheless, the evidence of inefficiencies in and inadequate services from the present complex of documentary services, when compared to some efficient, effective, and much used services, convinces the task group that an integrated national network of libraries and other document-handling systems covering all fields of science and technology should be brought into being.
4. It is too early to plan in detail such an integrated network. However, it is not too early to plan in general terms, and to begin the evolution of the present "system" into a more effective system.
5. Because of the Federal Government's major involvement in science and technology, the Federal Government should assume the leadership in the evolution of the information and document-handling systems network.

There must be, however, close cooperation and coordination with nongovernment services. The contributions of these organizations and enterprises are vital to the effective transfer of information, and their talents and resources should be utilized and strengthened.

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<sup>7/</sup> Memorandum from the President to the Heads of Departments and Agencies, dated September 14, 1965.

6. The following functions should be undertaken by a central Federal mechanism, working in concert with Federal agencies and non-governmental groups, to develop the integrated national network:
  - (a) define the subject areas, in addition to medicine and agriculture, for which individual Federal departments and agencies may accept responsibility for ensuring effective national information and document-handling systems
  - (b) develop Federal policies for
    - support of and cooperation with nongovernmental libraries
    - support and sponsorship of specialized information centers in science and technology
    - operation and support of government depository libraries
    - support of nongovernment publications
    - support of communications by means of nondocumentary mechanisms (e.g., meetings)
    - education and training of librarians and information technologists
    - acquisition and translation of foreign documents
    - copyrights and patents in information "software" and the new information transfer technologies
  - (c) review, in relation to the needs of the integrated national network, agency information budgets and programs
  - (d) propose legislation necessary for the integrated national network
  - (e) review, in view of the needs of the integrated national network, agency legislative proposals
  - (f) develop minimal technical and performance standards for Federal information and document activities
  - (g) develop guidelines for costs and other statistical information about Federal information and document activities
  - (h) coordinate agency programs for Federal support of prototype information systems of advanced design leading toward the integrated national network
  - (i) develop and maintain long-range plans for the integrated national network, modifying these plans in the light of changing needs, costs, technologies, manpower, and facilities
7. The Office of Science and Technology, with the advice and assistance of the Committee on Scientific and Technical Information, should

begin the exercise of the above functions in selected areas of science and technology, to test the practicality of the centralized-mechanism-plus-responsible-agent concept. The task group concludes that at present no organization other than the Office of Science and Technology can successfully undertake this assignment, and that a successful trial would provide a sound basis for further steps requiring new executive or legislative action.

In this conclusion, the task group differs with the System Development Corporation report, which recommends the immediate establishment of a new independent agency as the centralized mechanism. The task group believes the Capping Agency and Responsible Agent concepts recommended by the System Development Corporation require a clear demonstration of their desirability and practicality. The task group is aware of the problems which may arise from asking that the Executive Office of the President undertake, on an experimental basis, the central mechanism function suggested above.

The task group agrees with the System Development Corporation in rejecting the alternate proposals involving (a) a new Federal agency or Government chartered corporation to operate a centralized facility for all significant scientific and technical documents, and (b) creating such a centralized facility under the management of the Library of Congress. The arguments for and against the alternatives are presented in the System Development Corporation report (Appendix A, Volume I).

8. Responsibilities for ensuring, either internally or through other mechanisms, the effective operation of the document-handling subsystems in fields of science and technology should be discharged through existing Federal departments and agencies as an integral part of their research and development program. This includes the establishment, if necessary, of new organizational entities, such as switching centers and libraries for fields in science and technology.
9. New information systems are currently coming into being; some are under design, and a few, at the national level, are in the process of experimental operation and modification. It is important that both costs and effectiveness of these new communication systems be recorded and evaluated from their very beginnings. The cost and the effectiveness should be compared between various new systems, as well as with existing traditional and evolving systems.
10. Sufficient data exists from existing information systems to permit the development of crude but valuable models of possible new

national communications systems. Several alternatives of an overall design of a comprehensive national information system should be initiated without delay. The various costs, to include costs of installation, operation, and personnel, the relative effectiveness, and the potential benefits of the several alternatives should be estimated. The results and experience gained from the design model should permit manipulation of the design variables of new sub-systems and thus guide their specific design and the evaluation of the overall system.

#### Recommendations

It is, therefore, recommended that:

1. The Office of Science and Technology should accelerate its efforts on the overall planning, policy formulation, organization, coordination, and evaluation of the integrated national network of information and document-handling systems in science and technology. The Office of Science and Technology should take appropriate steps to clarify areas of responsibility among the Federal agencies in this area.
2. The Office of Science and Technology, in collaboration with the Bureau of the Budget, Federal departments, agencies, and other organizations involved in science and technology, should undertake the following tasks at once:
  - (a) To develop a comprehensive, coordinated program for ensuring the acquiring, cataloging, and announcing of the significant worldwide scientific and technical literature. The establishment of one or more national libraries in fields of science and technology in addition to medicine and agriculture, under the aegis of appropriate Federal departments and agencies should be considered as elements of the integrated national network.
  - (b) To develop policies concerning the legislative bases for document and information services in or sponsored by the departments and agencies.
  - (c) To propose or endorse legislation necessary to enable departments and agencies to assume responsibility for ensuring effective information and document-handling services in agreed-upon areas of science and technology.
3. The Office of Science and Technology, in collaboration with appropriate Federal agencies, should encourage the private sector to

formulate document-handling plans and programs for its consideration (and for review by appropriate agencies) in the development of the integrated national network.

4. The Committee on Scientific and Technical Information should recommend actions in the following areas:

(a) A new task to be undertaken is the development of a coordinated plan and criteria for Federal support of experiments in the technology of information science, including prototype information systems designated to provide design data for the integrated national network.

Continuing tasks of high priority are:

- (b) The development of standard procedures for processing documents so that interagency exchange can be more efficient and comprehensive.
- (c) The development of guidelines for cost and budgetary analyses and control by agencies of their document and information services.
- (d) The development of education and training curricula for the operators and users of the document and information systems.
- (e) The development of policies for acquisition, dissemination, translation of unclassified foreign documents in science and technology, and the dissemination of Federally-produced information and data to foreign countries and organizations.

November 30, 1964

FEDERAL COUNCIL FOR SCIENCE AND TECHNOLOGY  
COMMITTEE ON SCIENTIFIC AND TECHNICAL INFORMATION

CHARTER

for  
Task Group on National System(s)  
For Scientific and Technical Information

GOALS AND OBJECTIVES

The Task Group will:

1. Undertake those investigations needed to (a) inventory and evaluate the resources (people, libraries and other services, equipment, materials and funds) currently being utilized in national and other domestic scientific and technical information activities, and (b) ascertain the information needs of users such as: scientists, engineers, managers, practitioners, and the technical public, as individuals and as groups, in and out of the government.
2. Based upon these and other findings, prepare recommendations and plans for the development of national information system(s) to include actions for government agencies, suggestions for actions by the private sector, and steps to move from current to advanced information systems.

APPROACH AND SCOPE

The Task Group will undertake such studies as are necessary to provide requisite knowledge for its deliberations. Because of the varied interests and specialized knowledge of groups not directly represented on the Task Group, such as librarians, abstracting services, commercial publishers, and professional societies, it is the intent of the Task Group to call on representatives of such outside groups for information and suggestions. An illustrative list of problem areas includes:

1. Determine why and how the scientist, practitioner, manager and the technical public assimilate and use technical information and identify trends that in practice and under certain environmental conditions may change these use patterns.
2. Examine the relationships between producers, processors, wholesalers, retailers, users, and systems of scientific and technical

APPENDIX B

information. The study should seek to obtain such data as numbers of each type involved, size of operation, characteristics, trends, problems, economics, efficiency of effort, and education and training requirements. Both present and future aspects should be analyzed and evaluated.

3. Identify and evaluate a series of independent proposals for scientific and technical information systems presented in the last few years, considering for application those elements which appear to have immediate or future value for advanced information systems.
4. Analyze present and proposed national information systems which range from centralized to decentralized for costs, performance, resource requirements, impact, copyright and proprietary right problems, and methods of financing.
5. Examine other information systems in operation or under development of sufficient importance to the scientific and technical information community to warrant close coordination.
6. Consider the development of national information systems in relation to international scientific and technical information trends and patterns.
7. Review the state-of-the-art pertaining to equipments, facilities, techniques, organizations, as related to existing and potential national information system(s).